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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/550,805	07/12/2006	Tominaga Koji	FUJ-0001	3990

23413 7590 09/14/2007
CANTOR COLBURN, LLP
55 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002

EXAMINER

LUKE, DANIEL M

ART UNIT	PAPER NUMBER
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2813

MAIL DATE	DELIVERY MODE
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09/14/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/550,805	Applicant(s) KOJI ET AL.	
	Examiner Daniel Luke	Art Unit 2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 July 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 September 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>9/23/2005</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This Office Action is in response to the application filed on 7/12/2006.

Currently, claims 1-7 are pending.

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

IDS

The information disclosure statement (IDS) submitted on 9/23/2005 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Drawings

Figures 10(A) and 10(B) should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g).

The drawings are objected to because reference character 2a appears to be pointing to the gate insulating layer 4 in Fig. 1.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing

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should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. (Japanese Patent 2003-017684) in view of Imahashi (US Patent 5,338,362).

Pertaining to claim 1, Suzuki shows a method for forming an insulating film in a semiconductor device characterized in that a step of forming an insulating film and a step of removing impurities from the insulating film are repeated a plurality of times, to form an insulating film having a prescribed thickness ([0015]).

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Pertaining to claim 2, Suzuki shows the step of removing impurities is performed in a reducing gas atmosphere or an oxidizing gas atmosphere ([0015]).

Pertaining to claim 4, Suzuki shows the reducing atmosphere in the step of removing impurities is formed of any of single gases of an ammonia gas, a hydrogen gas and an inert gas, a mixed gas of these gases or plasma nitrogen, or formed in a vacuum ([0020]).

Suzuki fails to show that the insulating film is formed to have a thickness of 0.3 to 2 nm each step.

However, Imahashi teaches in column 8, lines 31-41 that an insulating film may be formed in intervals, in which 5 angstroms of insulating layer is deposited during each interval. Note that 5 angstroms is equal to 0.5 nm, which is within the range specified in claim 1.

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to form each sublayer of the insulating layer of Suzuki at a thickness of 5 angstroms, as taught by Imahashi, with the motivation that such a step-wise film-formation method in which sublayers are deposited to have small thicknesses allows for precise control over the final thickness of the insulating layer.

Claims 3 and 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. (Japanese Patent 2003-017684) in view of Imahashi (US Patent 5,338,362) as applied to claims 1 and 2 above, and further in view of Yamazaki et al. (US Patent Application 2002/0006711).

Suzuki as modified by Imahashi teaches the method of claim 1. Pertaining to claim 6, Suzuki as modified by Imahashi teaches the reducing gas is hydrogen ([0020]).

Suzuki as modified by Imahashi fails to teach, pertaining to claim 3, the step of removing impurities is performed in a reducing gas atmosphere combined with an oxidizing gas atmosphere; and, pertaining to claims 5 and 7, the oxidizing gas atmosphere in the step of removing impurities is formed of any of single gases of an oxygen gas, a nitrogen monoxide gas, a nitrous oxide gas and an ozone gas, a mixed gas of these gases or plasma oxygen.

However, Yamazaki teaches in [0026] that both hydrogen and oxygen are mixed and supplied to a substrate to remove impurities from the substrate.

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to use a combination of hydrogen as a reducing gas and oxygen as an oxidizing gas, as taught by Yamazaki, to remove the impurities in the method of Suzuki as modified by Imahashi, with the motivation that oxygen is able to remove carbon impurities consisting of non-single bonded carbons, while hydrogen is able to remove carbon impurities consisting of single bonded carbons (Yamazaki [0026]). Thus, by using hydrogen and oxygen in combination, the removal of all species of carbon impurities can be performed in one step, decreasing the process time.

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Conclusion


The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Ahn et al. (US Patent Application 2003/0207032) teaches that the formation of sublayers with small thicknesses is used to precisely control the overall thickness of a deposited layer.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel Luke whose telephone number is (571) 270-1569. The examiner can normally be reached on Monday through Friday 7:30 a.m. to 5:00 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DL
9/5/2007


CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800